

San Diego Local Capacity Needs

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CPUC Workshop: Application of SDG&E for Authority to Enter into Purchase Power Tolling Agreements with Escondido Energy Center, Pio Pico Energy Center and Quail Brush Power

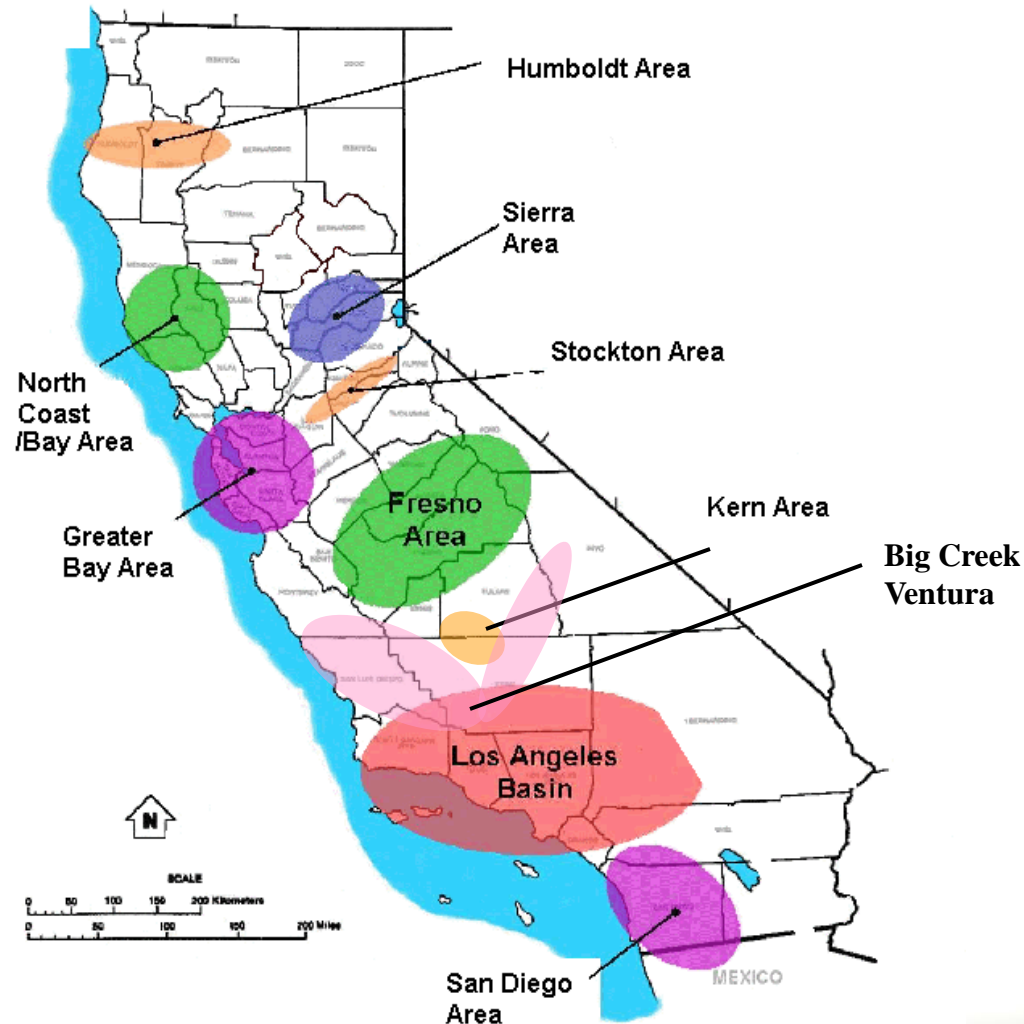
April 17, 2012 (Revised slides 8, 15, and 28 on 4-19-12)



Purpose of Testimony: Describe San Diego Local Capacity Needs

- Local Capacity Requirements Studies
 - 2012 LCR Study
 - 2013 LCR Study
 - 2016 LCR Study
- 2011/12 Transmission Planning Studies
 - 2021 OTC Study
 - 2021 Deliverability Study

LCR Areas within CAISO



Overview of the San Diego Area

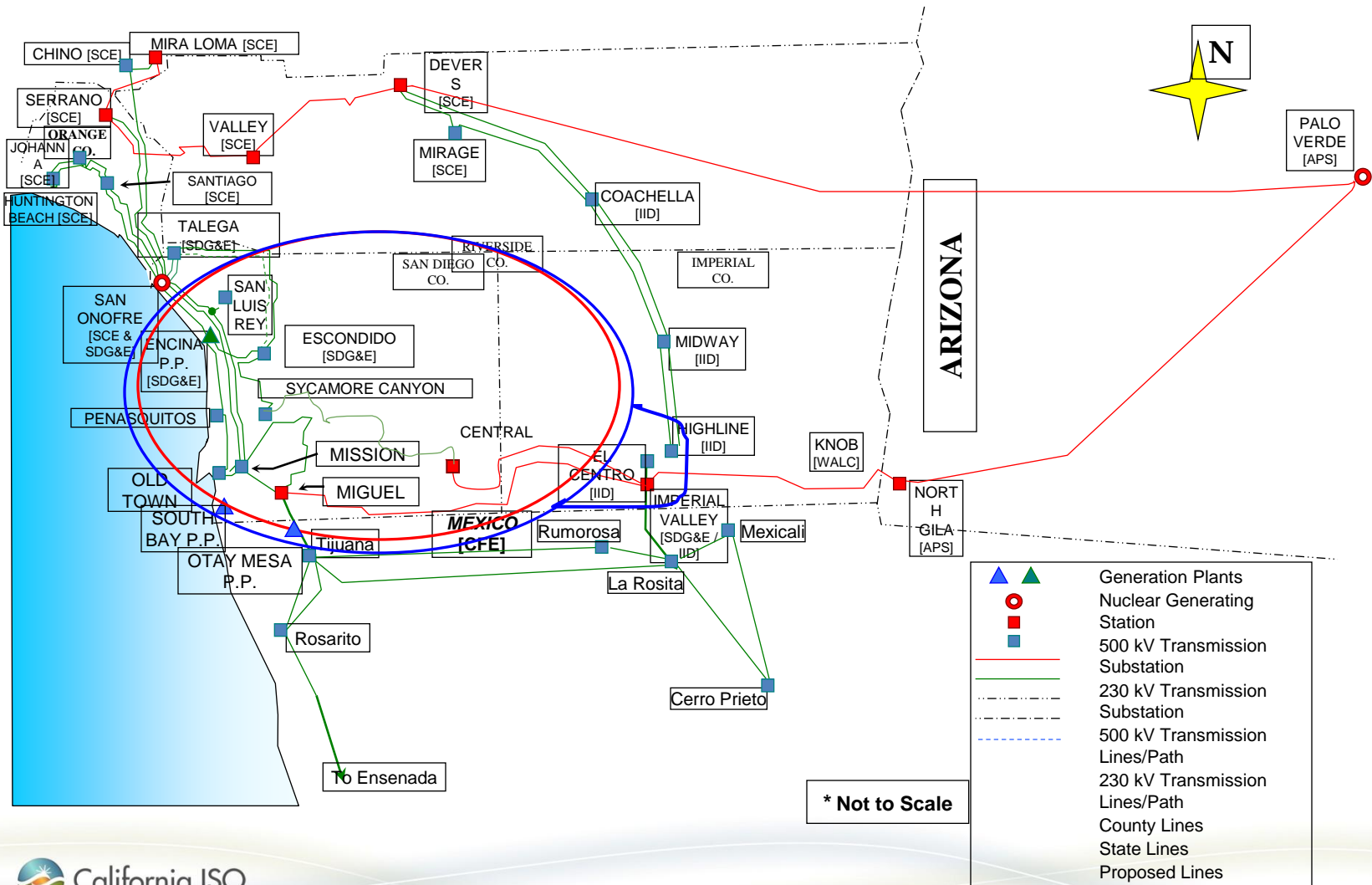


2012, 2013 and 2016 LCR Studies

Input Assumptions

- Transmission – all projects with expected on-line date up to study year
- Generation – all generation with COD up to Study year
- Load Forecast – 1 in 10 local area peak (based on 2009 CEC forecast)

San Diego LCR Area



2012, 2013, and 2016 San Diego Area Load and Resources (MW)

	2012	2013	2016
Total 1-in-10 Load + losses	4844	5114	5367
Generation			
Market Gen	2925	2925	2753
Muni Gen	0	0	0
Wind Gen	6	6	6
QF Gen	156	156	156
Total Qualifying Capacity**	3087	3087	2915

** Does not include Demand Side Management (DSM)

Areas and sub-areas studied

- El Cajon sub-area
- Rose Canyon sub-area
- Mission sub-area
- Bernardo sub-area
- Border sub-area
- Esco sub-area (2013)
- Pala sub-area (2013)
- San Diego area
- Greater IV-San Diego

Sub-Area Needs and Mitigation

El Cajon Sub-area

- Small sub-area
- No deficiency expected
- Effective Units: El Cajon GT, Calpeak El Cajon and new peaker at El Cajon 69kV

Rose Canyon Sub-area

- Sub-area is eliminated due to recently approved transmission project, TL6927, Eastgate-Rose Canyon 69kV reconductor

Border Sub-area

- Sub-area eliminated due to new generation project upgrade, reconductor TL649A, Otay-Otay Lakes Tap 69kV

Sub-Areas (continued)

Mission Sub-area

- Planned transmission projects will eliminate the local capacity need in this sub-area.
 - Reconnector the Mission – Clairmont (TL670), Mission – Kearny (TL663) and Mission Mesa Heights (TL676) 69 kV lines (expected in-service date – 2015).

Bernardo Sub-area

- Planned transmission project will eliminate the local capacity need in this sub-area.
 - Build a new Sycamore – Bernardo 69kV line (expected to be in-service in 2015)

Sub-Areas (continued)

Esco Sub-area

- Contingency: the loss of Poway-Pomerado 69 kV line (TL6913) followed by the loss of Bernardo-Rancho Carmel 69kV (TL633)
- LCR: 74 to 114 MW (includes 40 MW of QF and 30 to 74 MW of deficiency)
- Limiting component: Thermal overload on the Esco-Escondido 69kV line (TL6908)
- Effective Unit: Goal line

SDG&E Area (2013 results)

San Diego Area

- Contingency: Loss of East County – Miguel 500kV line overlapping with the loss of Sunrise 500 kV line
- LCR: **2570** MW (include 162 MW of QF/Wind)
- Limiting component: Voltage instability

Contingency Reclassification: WECC System Performance Criteria

Adjacent Transmission Circuits: (per WECC Glossary of Terms)

“Adjacent Transmission Circuits are two transmission circuits with separation between their center lines **less than 250 feet at the point of separation** with no Bulk Electric System circuit between them. Transmission circuits that cross, but are otherwise separated by 250 feet or more between their centerlines, are not Adjacent Transmission Circuits.”

Effective Date:
April 01, 2012

TPL-001-WECC-CRT-2: (Regional Criteria)

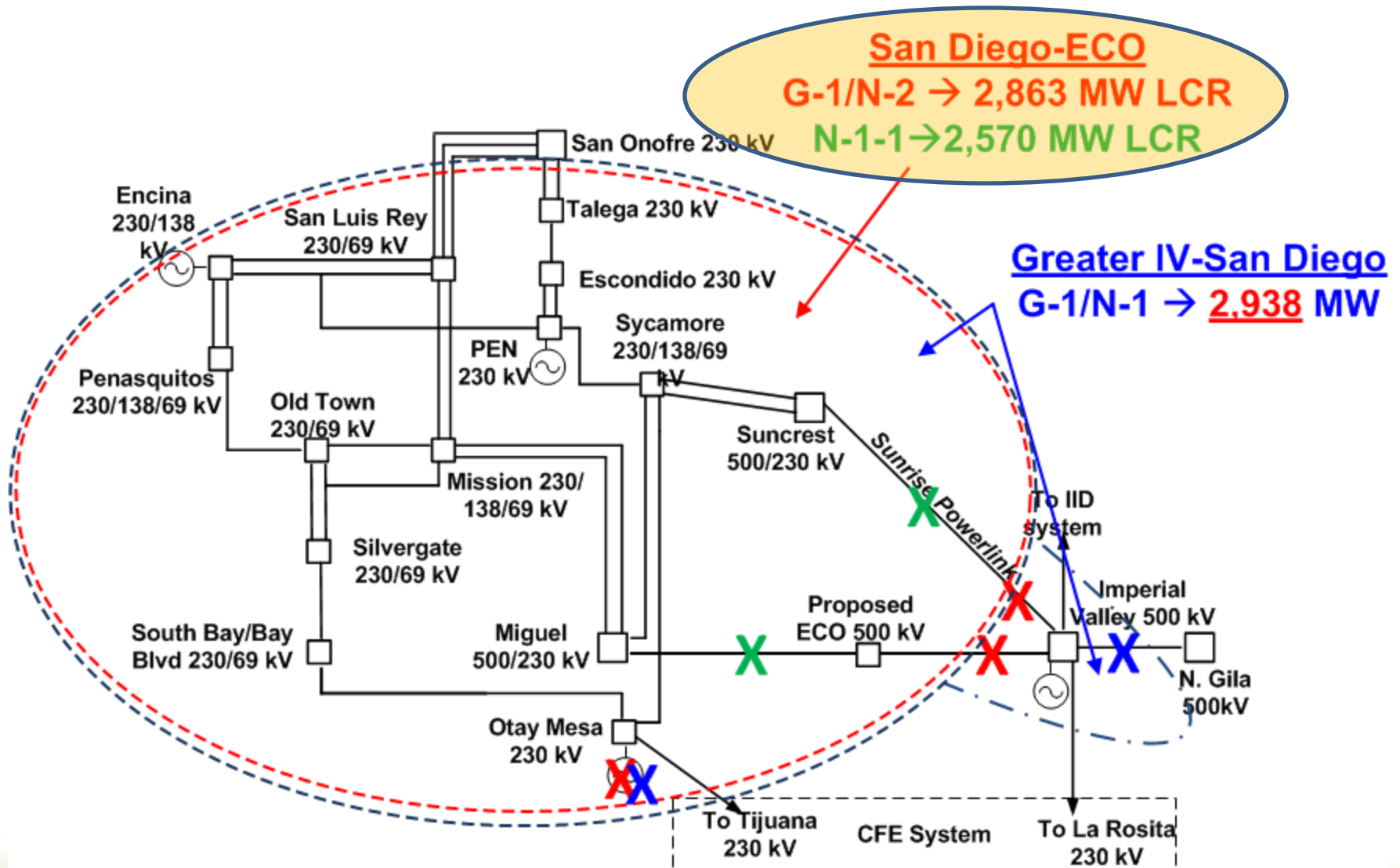
R 1.1:

The NERC Category C5 initiating event of a single-line-to-ground fault with normal clearing shall also apply to the common mode contingency of two Adjacent Transmission Circuits on separate towers.

Requirement R1.1 **does not apply** to Adjacent Transmission Circuits that share a common right-of-way for a total of **three miles or less**, including – but not limited to – substation entrances, pinch points, and river crossings.

**Total linear footage of the common corridor of
SWPL and Sunrise where there is 250' or less of
centerline separation is 3600'.**

Impact on 2013 LCR Study



2013 San Diego LCR Summary

- SDG&E load + losses = 5,114 MW

LCR Area	Loads + Losses (MW)	Critical Contingency	Limiting Constraint	LCR (MW)
San Diego-ECO	5,114	G-1/N-2 Otay Mesa PP + Sunrise+SWPL (No load shed)	Post-transient Voltage Instability	2,863
San Diego-ECO	5,114	N-1-1 Sunrise + SWPL	Post-transient Voltage Instability	2,570
Greater IV-San Diego	5,114	G-1/N-1 Otay Mesa PP + IV – North Gila 500kV	Path 44 limit of 2500 MW	2,938

- N-1-1 contingency was tested with 2.5% load increase to satisfy voltage stability performance criteria for Category C contingency
- No load shed (automatic or manual) was assumed while testing the N-2 or N-1-1 combination of Sunrise and SWPL

Greater IV- San Diego Area

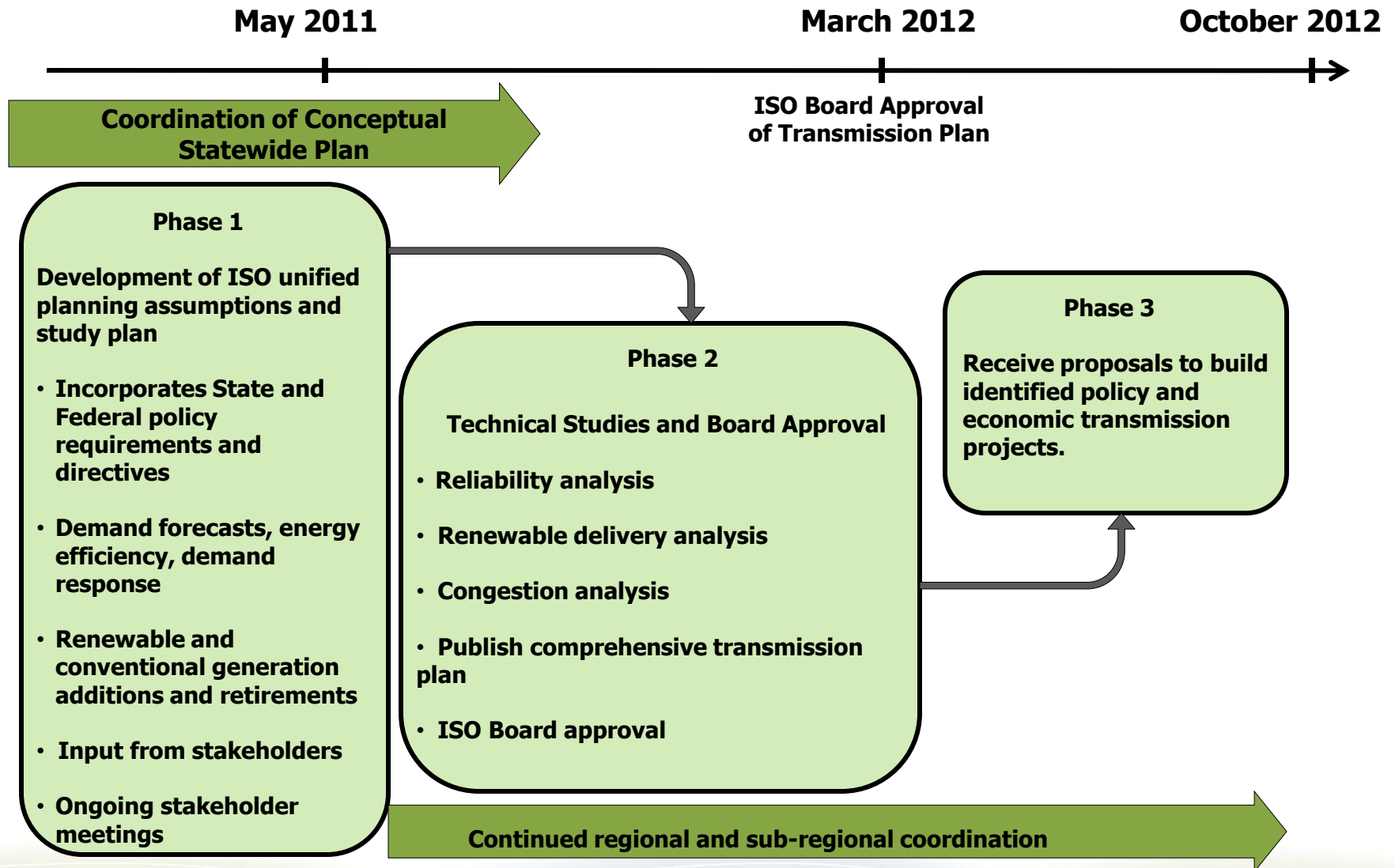
- Contingency: Loss of Imperial Valley – North Gila 500kV line (TL50002) with the Otay Mesa Combined Cycle power plant out of service
- LCR: **2804 to 2966** MW (include 162 MW of QF/Wind)
- Limiting component: South of SONGS (P44) limit of 2500 MW (N->S)
- Effective Units: All units in Greater IV and San Diego area

2021 OTC Study

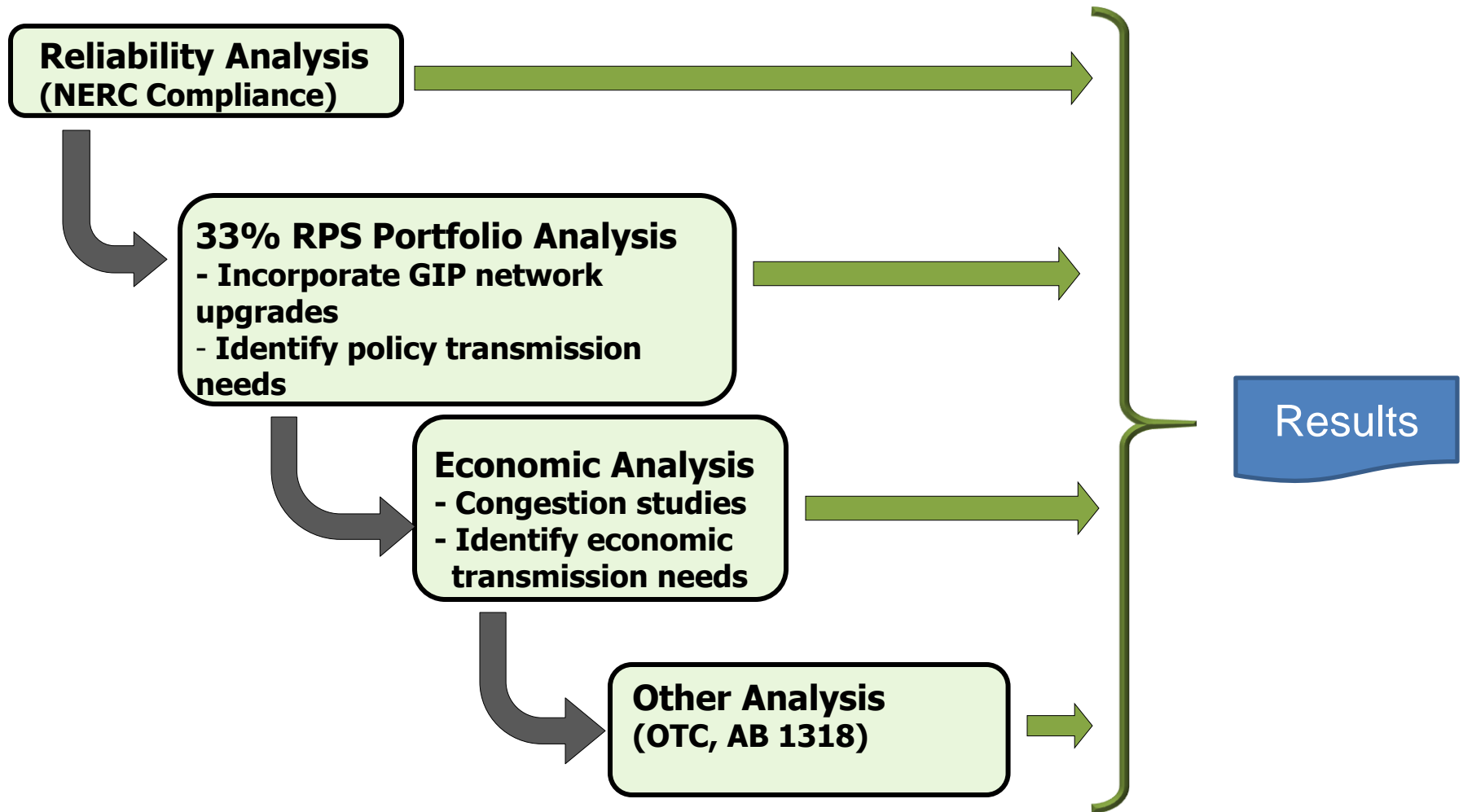
Overview

- 2011/12 Transmission Planning Process
- Renewable Portfolio assumptions
- Overview of the State Water Board's schedule on OTC plants
- Objectives and overview of OTC study
- Study results in the San Diego area

Development of the 2011/2012 Transmission Plan



Development of 2011/2012 Annual Transmission Plan



Renewable Portfolios

	Resources Selected by Scenario (MW)				
	33% Trajectory	33% Environ- mentally- Constrained	33% Time- Constrained	33% Updated Cost- Constrained	2011/12 TPP Base Portfolio
Tehachapi	4,445	3,491	4,150	3,489	3,489
Imperial	1,202	347	-	1,693	1,693
Northwest	2,359	838	2,359	711	711
Pisgah	1,775	275	275	275	275
NonCREZ	924	449	930	802	652
Solano	1,129	300	-	535	535
Riverside East	1,192	1,192	1,650	1,042	1,192
Alberta	886	450	886	450	450
Mountain Pass	888	-	-	523	523
Carrizo South	900	900	900	900	900
Utah-Southern Idaho	258	258	258	258	258
San Diego South	400	400	400	699	699
Colorado	420	-	1,371	420	223
Nevada C	450	549	549	450	450
Distributed Solar - PG&E	500	2,000	822	773	773
Montana	300	300	300	300	300
Distributed Solar - SCE	500	2,635	895	750	750
Arizona	290	290	1,390	290	290
Wyoming	96	4	461	461	412

Renewable Portfolios

	Resources Selected by Scenario (MW)				
	33% Trajectory	33% Environ- mentally- Constrained	33% Time- Constrained	33% Updated Cost- Constrained	2011/12 TPP Base Portfolio
New Mexico	32	78	947	947	947
Round Mountain	78	100	100	100	100
Palm Springs	77	178	178	178	178
San Bernardino - Lucerne	49	140	261	261	261
Kramer	62	62	62	62	362
Distributed Solar - SDGE	52	325	77	78	78
British Columbia	2	52	52	50	50
Remote DG (Brownfield) - SDGE	-	78	4	9	9
Remote DG (Brownfield) - PG&E	-	1,842	100	206	206
Remote DG (Brownfield) - SCE	-	564	31	63	63
Distributed Solar - Other	-	1,062	363	-	-
Westlands	-	800	-	-	-
Remote DG (Brownfield) - Other	-	571	31	-	-
Fairmont	-	-	-	-	-
Santa Barbara	-	-	-	-	-
Remote DG (Greenfield) - PG&E	-	-	-	412	412
Remote DG (Greenfield) - SCE	-	-	-	126	126
Remote DG (Greenfield) - SDG&E	-	-	-	17	17

Summary of State Water Board and Generator Owners Implementation Schedule for OTC Plants

Power Plant	SWRCB's Implementation Date	Generator Owner's Proposed Dates
Humboldt Bay	12/31/2010	Compliant
Potrero	One year after the effective date of policy (10/1/2011)	Compliant
South Bay	12/31/2011	Compliant
El Segundo, Harbor (LADWP), Morro Bay	12/31/2015	ES3 (7/1/2011), ES4 12/31/2017), H5(12/31/2029), MB (12/31/2015)
Encina, Contra Costa, Pittsburg, Moss Landing	12/31/2017	E (12/31/2017), CC (4/30/2013), PTSB (12/31/2017), ML 1&2 (12/31/2032), ML 6&7 (12/31/2017)
Haynes (LADWP)	12/31/2019	Haynes 1&2 (12/31/2029), Haynes 5&6 (12/31/2013), Haynes 8, 9, 10 (12/31/2029)
Huntington Beach, Redondo, Alamitos, Mandalay, Ormond Beach, Scattergood (LADWP)	12/31/2020	HB 1&2 (12/31/2022), HB 3&4 (2012 – sold to EME to transfer emission credits to Walnut Creek Energy Center), RB 5&6 (12/31/2022), RB 7&8 (2018?), OB (12/31/2020), Scattergood 1&2 (12/31/2024), SG 3 (12/31/2015)
San Onofre Nuclear Generating Station	12/31/2022	12/31/2022
Diablo Canyon Power Plant	12/31/2024	12/31/2024

Study Scope for OTC local capacity study

- Determined OTC generation level needed to meet LCR needs by areas within ISO BAA to maintain grid reliability in the local and zonal areas for target 2021 time frame under the following RPS portfolios:
 - CPUC trajectory, environmentally constrained and time constrained portfolios;
 - ISO base case portfolio (aka variation of CPUC cost-constrained portfolio)

Note: Diablo Canyon & San Onofre nuclear generating units were assumed to remain on-line

Major New Transmission Projects

- Carrizo – Midway
- South Contra Costa
- Tehachapi transmission project
- Colorado River – Valley 500kV line
- Eldorado – Ivanpah 230kV lines
- Sunrise Powerlink
- East County (ECO) substation
- West of Devers upgrades
- Pisgah – Lugo 500kV lines
- Borden – Gregg
- Path 42 (IID – SCE) upgrades

Major New Generation Projects

- Thermal generation completed or under construction
 - Marsh Landing (760 MW)
 - Gateway (530 MW)
 - Russell City Energy Center (600 MW)
 - Colusa Generation Station (660 MW)
 - Los Esteros Combined Cycle (140 MW)
 - Walnut Creek Energy Center (500 MW)
 - Canyon Power Plant (City of Anaheim – 200 MW)
 - NRG El Segundo Repowering Project (570 MW)
 - Sentinel Peaker Project (850 MW)
 - Oakley Generating Station (624 MW)
 - Mariposa (184 MW)
- Renewable generation projects
 - Refer to 33% RPS presentation

San Diego Area Load and Resources Summary

Itemized Details	Trajectory (MW)	Environmentally Constrained (MW)	ISO Base Case (MW)	Time Constrained (MW)
Total 1-in-10 Load + losses	5,745	5,751	5,745	5,741
Generation				
Existing NQC (2012)	3,049 Cabrillo 2 units are included in this number but were not modeled in the base cases used in the analysis.			
Existing OTC NQC (2012)	950			
Distributed generation	52	402	104	81
SDG&E Non-Simultaneous Import Capability (for SDG&E only)	3,500	3,500	3,500	3,500

Areas studied

- San Diego Area
 - San Diego
 - Greater Imperial Valley – San Diego (IV-San Diego)

Trajectory Portfolio LCR Study Results

Portfolios	Area	LCR		Total (MW)	Existing OTC Units Needed?	Constraint	Contingency
		Non-D.G. (MW)	D.G. (Mw)				
Trajectory	SDG&E Overall	2,852	31	2,883	Yes	South of SONGS separation Scheme	Otay Mesa (G-1) + SWPL + SRPL
	Greater IV - San Diego	3,260	31	3,291*	No	P44 rating of 2500 MW	Otay Mesa (G-1) + IV-NG

* Assuming a fix for voltage deviations in Western Arizona subtransmission

Environmentally Constrained Portfolio LCR Study Results

Portfolios	Area	LCR			Existing OTC Units Needed?	Constraint	Contingency
		Non-D.G. (MW)	D.G. (Mw)	Total (MW)			
Environmentally Constrained	SDG&E Overall	2,665	194	2,859	Yes	South of SONGS separation Scheme	Otay Mesa (G-1) + SWPL + SRPL
	Greater IV - San Diego	2,910	194	3,104	No	P44 rating of 2500 MW	Otay Mesa (G-1) + IV-NG

ISO Base Case Portfolio Study Results

Portfolios	Area	LCR		Total (MW)	Existing OTC Units Needed?	Constraint	Contingency
		Non-D.G. (MW)	D.G. (Mw)				
ISO Base	SDG&E Overall	2,858	42	2,900	Yes	South of SONGS separation Scheme	Otay Mesa (G-1) + SWPL + SRPL
	Greater IV - San Diego	2,926	42	2,968	No	P44 rating of 2500 MW	Otay Mesa (G-1) + IV-NG

Time Constrained Portfolio LCR Study Results

Portfolios	Area	LCR		Total (MW)	Existing OTC Units Needed?	Constraint	Contingency
		Non-D.G. (MW)	D.G. (Mw)				
Time Constrained	SDG&E Overall	2,791	65	2,856	Yes	South of SONGS separation Scheme	Otay Mesa (G-1) + SWPL + SRPL
	Greater IV - San Diego	3,207	65	3,272*	Yes	P44 rating of 2500 MW	Otay Mesa (G-1) + IV-NG

* Assuming a fix for voltage deviations in Western Arizona subtransmission

Conclusions – Range of LCR Requirements

LCR Area	Trajectory (MW)	Environmental Constrained (MW)	ISO Base Case (MW)	Time Constrained (MW)
San Diego	2,883	2,854	2,864	2,856
IV – San Diego	3,291	3,104	2,968	3,272
OTC Range*	531* - 950	231* - 650	231* - 650	421* - 840

* Lower values correspond to the use of SDG&E-proposed generation included in Long Term Procurement Plan

2021 OTC Results

- SDG&E load + losses = 5,745 MW

LCR Area	Contingency	Limiting Constraint	Traject (MW)	Env (MW)	ISO Base (MW)	Time (MW)
San Diego	G-1/N-2 (Assuming load shed)	8000 Amp limit on P44	LCR = 2,883** OTC = 531* - 950	LCR = 2,854** OTC = 231* - 650	LCR = 2,864** OTC = 231* - 650	LCR = 2,856** OTC = 421* - 840
		7800 Amp limit on P44 (2.5% margin)	LCR = 2,939** OTC = 520* - 939	LCR = 2,922** OTC = 299* - 718	LCR = 2,930** OTC = 299* - 718	LCR = 2,911** OTC = 470* - 889
San Diego	N-1-1 (No load shed)	8000 Amp limit on P44	LCR = 2,680 OTC = 318* - 737	LCR = 2,625 OTC = 0* - 402	LCR = 2,669 OTC = 218* - 637	LCR = 2,633 OTC = 201* - 620
		7800 Amp limit on P44 (2.5% margin)	LCR = 2,735 OTC = 373* - 792	LCR = 2,702 OTC = 60* - 479	LCR = 2,694 OTC = 243* - 662	LCR = 2,691 OTC = 260* - 679
		Voltage Collapse (accounting for 2.5% margin)	LCR = 2,646 OTC = 311* - 730	LCR = 2,524 OTC = 0* - 300	LCR = 2,663 OTC = 211* - 630	LCR = 2,553 OTC = 121* - 540

* Lower OTC range value corresponds to the use of SDG&E-proposed generation included in the Long-Term Procurement Plan.

** Load curtailment of approximately 370 MW was simulated to achieve stability under G-1/N-2 contingency.

2021 Deliverability Study

Objectives of Base Portfolio Deliverability Assessment

- Determine deliverability of the Target Maximum Import Capability
- Determine deliverability of renewable resources inside CAISO BAA
- Identify transmission upgrades to support full deliverability of the renewable resources and Target MIC

Overview of Assumptions

- Deliverability assessment is performed for the base portfolio.
- Generation dispatch and imports based on ISO Deliverability Study Methodology
- 2021 transmission model and loads

Target Maximum Import Capability (MIC) as required by Reliability Requirements BPM 5.1.3.5.1

- Target MIC is determined in order to accommodate renewable resources along with Pre-RA Imports Commitments still active for the year under study in the base portfolio.
- About 1500 MW of Target MIC is required for imports from IID between:
 - IID – SCE: Path 42
 - IID – SDGE: Dixie Valley / El Centro – Imperial Valley
- All other branch groups or sum of branch groups have enough Remaining MIC in order to achieve deliverability for all external renewable resources in the base portfolio.

Import Assumptions

- 1500 MW total import from IID between IID-SCE branch group and IID-SDGE branch group.
- Maximum summer peak simultaneous historical import schedules on other import branch groups.
- Historically unused Existing Transmission Contracts are modeled by equivalent generators at the tie point.

Generation Assumptions

- Deliverability assessment is performed for generating resources in the base portfolio.
- Generation capacity tested for deliverability
 - Existing non-intermittent resources: most recent summer peak NQC
 - New non-intermittent resources: installed capacity in the base portfolio
 - Intermittent resources: 50% (low level) and 20% (high level) exceedance during summer peak load hours

Overview of renewable zones that impact San Diego area

Renewable Zone	Base Portfolio MW
Imperial – IID	1,289
Imperial – SDG&E	404
San Diego South	699
SDG&E DG	104
Arizona	290
Total	2,786

Deliverability Constraints

Overloaded Facility	Contingency	Flow	Undeliverable Zone	MW Not Deliverable Without Upgrades	Mitigation
Miguel Tap-Bay Boulevard 230 kV	Base Case	102%	Imperial-SDG&E, Imperial-IID	190 MW	Reconfigure TL23041 and TL23042 at Miguel Substation to create two Otay Mesa-Miguel 230 kV lines (C1C2 PhII pending LGIA)
Division-Sampson 69 kV	Silvergate-Bay Boulevard 230 kV	105%	San Diego: existing-Border, Otay, Otay Mesa	70 MW	
Montgomery Tap-Sweetwater 69 kV	Silvergate-Bay Boulevard 230 kV	129%	San Diego: existing-Border, Otay, Otay Mesa	422 MW	
Sweetwater-Sweetwater Tap 69 kV	Silvergate-Bay Boulevard 230 kV	136%	San Diego: existing-Border, Otay, Otay Mesa	472 MW	

Sensitivity Study – OTC retirement

- Assumed that Encina units 1-5 and GT are retired (964 MW total)
- Added the following projects:
 - 300 MW at Otoy Mesa substation
 - 100 MW at Mission-Miguel 230 kV line
 - Reconfigure TL23041 and TL23042 at Miguel Substation to create two Otoy Mesa-Miguel 230 kV lines
 - Modify existing Otoy Mesa SPS to include generation tripping for N-1 outages of Otoy Mesa-Miguel 230 kV lines

Results of OTC sensitivity study

Overloaded Facility	Contingency	Flow	Undeliverable Zone	MW Not Deliverable Without Upgrades	Mitigation
Miguel-Bay Boulevard 230 kV	Base Case	114%	Imperial-SDG&E, Imperial-IID, San Diego South San Diego: existing-Otay Mesa, Imperial Valley	1126 MW	Reconductor line Other alternatives: - Install phase shifter on Imperial Valley-La Rosita 230 kV line to change direction of loop flow through CFE system (flow must be west-to-east)

Results of OTC sensitivity study

Overloaded Facility	Contingency	Flow	Undeliverable Zone	MW Not Deliverable Without Upgrades	Mitigation
Old Town-Penasquitos 230 kV	Base Case	101%	Imperial-SDG&E, Imperial-IID, San Diego South Otay Mesa	30 MW	Reconductor line Other alternatives: - Install phase shifter on Imperial Valley-La Rosita 230 kV line to limit loop flow through CFE system

Results of OTC sensitivity study

Overloaded Facility	Contingency	Flow	Undeliverable Zone	MW Not Deliverable Without Upgrades	Mitigation
Silvergate-Old Town 230 kV	Mission-Old Town 230 kV and Silvergate-Old Town-Mission 230 kV	110%	Imperial-SDG&E, Imperial-IID, San Diego South Otay Mesa	638 MW	Reconductor line Other alternatives: - Install SPS to trip generation
Doublet Tap-Friars 138 kV	Old Town-Penasquitos 230 kV	122%	Imperial-SDG&E, Imperial-IID, San Diego South San Diego: existing-Border, Otay, Otay Mesa;	638 MW	Reconductor line Other alternatives: - Install SPS to trip generation

Summary of Deliverability Sensitivity Study

- Additional upgrades identified in sensitivity study are caused by the combination of the retirement of Encina and addition of new Pio Pico, Quail Brush and Escondido Energy Center resources
- If new Carlsbad generation were added to the sensitivity case with Pio Pico and Quail Brush then the additional overloads identified in the sensitivity case would be eliminated except for Miguel-Bay Blvd 230 kV overload
- Miguel-Bay Blvd 230 kV overload can be mitigated by stringing conductor on the currently empty side of the double circuit tower line.